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Epidemiologic Notes and Reports

Update: Acquired Immunodeficiency Syndrome and Human Immunodeficiency Virus Infection Among Health-Care Workers

Acquired immunodeficiency syndrome (AIDS) among health-care workers in the United States results primarily from human immunodeficiency virus (HIV) infections that occur outside of the health-care setting. However, a small number of health-care workers have been infected with HIV through occupational exposures, and one such worker has developed AIDS after documented seroconversion. This report summarizes and updates both national surveillance data for AIDS among health-care workers and data from prospective studies on the risk of HIV transmission in the health-care setting.

Health-Care Workers with AIDS

The AIDS case report form used by CDC requests that state and local health departments collect information on employment since 1978 in a health-care or clinical laboratory setting. For surveillance purposes, any person who indicates such employment is classified as a health-care worker.

As of March 14, 1988, a total of 55,315 adults with AIDS had been reported to CDC. Occupational information was available for 47,532 of these persons, 2,586 (5.4%) of whom were classified as health-care workers. A similar proportion (5.7%) of the U.S. labor force was employed in health services (*1*).

Forty-six states, the District of Columbia, and Puerto Rico have reported health-care workers with AIDS. Like other AIDS patients, health-care workers with AIDS had a median age of 35 years. Males accounted for 91.6% of health-care workers with AIDS and 92.4% of other patients with AIDS. The majority of health-care workers with AIDS (62.8%) and of other AIDS patients (60.5%) were white.

Ninety-five percent of the health-care workers with AIDS were classified into known transmission categories (Table 1). Health-care workers with AIDS were significantly less likely than others with AIDS to be intravenous drug abusers and more likely to be homosexual or bisexual men. They were also less likely to have a known risk factor reported ($p < 0.001$).

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To determine the possible cause of HIV infection, state and local health departments investigate those AIDS patients reported as having no identified risk. As of March 14, 1988, investigations had been completed for 121 of the 215 health-care workers initially reported with undetermined risk. Risk factors were identified for 80 (66.1%) of these. Of the 135 health-care workers who remain in the undetermined-risk category, 41 (30.4%) could not be reclassified after follow-up; 20 (14.8%) had either died or refused to be interviewed; and 74 (54.8%) are still under investigation.

Overall, 5.3% of health-care workers with AIDS had an undetermined risk. When examined by year of report to CDC, the proportion of such health-care workers appears to have increased from 1.5% in 1982 to 6.2% in 1987. However, 71 of the 135 health-care workers for whom risk is still undetermined have been reported since March 1987, and 80.0% of these 71 cases are still under investigation. The proportion of other AIDS patients with an undetermined risk has also increased over time. However, previous experience suggests that other risk factors for HIV infection will be identified for many of these persons when investigations have been completed (*2*). Ten percent of all reported AIDS patients with undetermined risk are health-care workers; this proportion has not changed over time.

A health-care worker reported to have developed AIDS after a well-documented occupational exposure to blood and HIV seroconversion is included among the 80 health-care workers who were reclassified after follow-up. The worker was accidentally self-injected with several milliliters of blood from a hospitalized patient with AIDS while filling a vacuum collection tube. Investigation revealed no other risk factors for this health-care worker.

Forty-one health-care workers could not be reclassified after investigation; 68.3% were men. In contrast, 23.0% of individuals employed in hospitals and health services in the United States are men (*1*). These 41 health-care workers comprised eight physicians, four of whom were surgeons; one dentist; five nurses; eleven nursing assistants or orderlies; seven housekeeping or maintenance workers; four clinical laboratory technicians; one respiratory therapist; one paramedic; one mortician; and two others who had no contact with patients or clinical specimens. A comparison of

TABLE 1. Comparison of health-care workers with AIDS and other AIDS patients reported to CDC, by transmission category — through March 14, 1988

Transmission Category	Health-Care Workers with AIDS No.	(%)	Other AIDS Patients No.	(%)
Homosexual or Bisexual Male	1,916	(74.1)*	28,820	(64.1)
Heterosexual Intravenous Drug Abuser	161	(6.2)*	8,263	(18.4)
Homosexual or Bisexual Male and Intravenous Drug Abuser	187	(7.2)	3,267	(7.3)
Hemophilia/Coagulation Disorder	20	(0.8)	451	(1.0)
Heterosexual	119	(4.6)	1,772	(3.9)
Blood/Blood Component Recipient	47	(1.8)	1,105	(2.5)
Other†	1	(<1.0)	0	(0.0)
Undetermined§	135	(5.3)*	1,268	(2.8)
Total	**2,586**	**(100.0)**	**44,946**	**(100.0)**

*$p<0.001$, chi square analysis.
†Represents health-care worker who seroconverted to HIV and developed AIDS after documented needlestick exposure to blood.
§Includes patients who are under investigation, who died or refused interview, or for whom no risk was identified after follow-up.

AIDS and HIV – Continued

the occupations of these 41 health-care workers with those of health-care workers for whom risk factors and job information were available showed that maintenance workers were the only occupational group significantly more likely to have an undetermined risk (7 [17.1%] of 41 health-care workers with undetermined risk, compared with 160 [7.1%] of 2,263 health-care workers with identified risk, p = 0.02).

Seventeen of the 41 investigated health-care workers with undetermined risk (including two of the seven maintenance workers) reported needlestick and/or mucous-membrane exposures to the blood or body fluids of patients during the 10 years preceding their diagnosis of AIDS. However, none of the patients was known to be infected with HIV at the time of exposure, and none of the health-care workers was evaluated at the time of exposure to document seroconversion to HIV antibody. None of the remaining 24 health-care workers reported needlestick or other nonparenteral exposures to blood or body fluids.

Other Health-Care and Laboratory Workers with HIV Infection

As of December 31, 1987, 1,176 health-care workers had been enrolled and tested for HIV antibody in ongoing CDC surveillance of health-care workers exposed to blood or other body fluids from HIV-infected patients. Of the 1,070 workers tested ≥90 days after exposure, 870 (81.3%) had parenteral exposures to blood; 104 (9.7%) had exposures of mucous membrane or nonintact skin to blood; and 96 (9.0%) had exposures to other body fluids (Table 2).

Four (0.5%) of the 870 workers with parenteral exposures to blood were seropositive for HIV antibody (upper bound of the 95% confidence interval [CI] = 1.1%). However, one of these four was not tested until 10 months after exposure (*3,4*). In addition, this worker had an HIV-seropositive sexual partner, and heterosexual acquisition of infection could not be excluded. Of the 489 health-care workers who sustained parenteral exposures to blood and for whom both acute- and convalescent-phase serum samples had been obtained, three, or 0.6%, seroconverted to HIV within 6 months of exposure (upper bound of the 95% CI = 1.6%) (*4-6*). Investigation revealed no nonoccupational risk factors for these three workers.

Two other ongoing prospective studies assess the risk of nosocomial acquisition of HIV infection among health-care workers in the United States (*7,8*). As of April 30, 1987, the National Institutes of Health had tested 103 health-care workers with documented needlestick injuries and 691 health-care workers with more than 2,000 cutaneous or mucous-membrane exposures to blood or other body fluids of

TABLE 2. HIV infection among health-care workers, by type of exposure and body fluid – CDC Prospective Study, August 15, 1983–December 31, 1987

	No. of Health-Care Workers with Exposure to				
Type of Exposure	**Blood**	**Saliva**	**Urine**	**Other/Unknown**	**No. of Infections**
Parenteral (needlestick or cut with sharp object)	870	7	3	21	4*
Contamination of mucous-membrane, open wound, or nonintact skin	104	42	12	11	0

*All four health-care workers had parenteral exposure to HIV-infected blood; risk is 4/870, or 0.5% (upper bound of 95% confidence interval = 1.1%).

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HIV-infected patients; none had seroconverted (*7*). As of March 15, 1988, a similar study at the University of California of 235 health-care workers with 644 documented needlestick injuries or mucous-membrane exposures had identified one seroconversion following a needlestick (*9*; University of California, San Francisco, unpublished data). Prospective studies in the United Kingdom and Canada show no evidence of HIV transmission among 220 health-care workers with parenteral, mucous-membrane, or cutaneous exposures (*10,11*).

In addition to the health-care workers enrolled in these longitudinal surveillance studies and the case reported here, six persons from the United States and four persons from other countries who denied other risk factors for HIV infection have reportedly seroconverted to HIV after parenteral, nonintact skin, or mucous-membrane exposures to HIV-infected blood or concentrated virus in a health-care or laboratory setting (Table 3) (*12-20*). Six additional health-care workers with no other identified risk factors reportedly acquired HIV infection, but the date of seroconversion is unknown (*3,15,21-23*).

Reported by: AIDS Program, Hospital Infections Program, Center for Infectious Diseases, CDC.

Editorial Note: These data are consistent with previous observations that the occupational risk of acquiring HIV in health-care settings is low and is most often associated with percutaneous inoculation of blood from a patient with HIV infection. Prospective surveillance studies, which provide data on the magnitude of the risk of HIV infection, indicate that the risk of seroconversion following needlestick exposures to blood from HIV-infected patients is less than 1.0%. The level of risk associated with the exposure of nonintact skin or mucous membranes is likely far less than that associated with needlestick exposures. Individual published case reports must be interpreted with caution because they provide no data on the frequency of occupational exposures to HIV or the proportion of exposures resulting in seroconversion.

The reasons that a higher proportion of health-care workers with AIDS have no identified risk than do other persons with AIDS are unknown. They could include a tendency of health-care workers not to report behavioral risk factors for HIV infection, the occupational risk of HIV infection as a result of blood exposure, or both. The first hypothesis is suggested by the overrepresentation of men among these health-care workers, a finding that is similar to the overrepresentation of men among AIDS patients infected with HIV through sexual activity or intravenous drug abuse. The second hypothesis is suggested by the documentation of HIV transmission in the health-care setting. Similar hypotheses may be raised for the apparent excess of maintenance personnel among health-care workers with no identified risk for AIDS. Occupationally acquired HIV infection in such workers would be difficult to determine unless the source patient or clinical specimen was known to be HIV-positive, the occupational exposure had been well documented, and the HIV seroconversion of the health-care worker had been detected.

The increasing number of persons being treated for HIV-associated illnesses makes it likely that more health-care workers will encounter patients infected with HIV. The risk of transmission of HIV can be minimized if health-care workers use care while performing all invasive procedures, adhere rigorously to previously published recommendations, and use universal precautions when caring for all patients (*5*). In addition, employers should instruct health-care workers on the need for routine use of universal precautions, provide equipment and clothing necessary to minimize the risk of infection, and monitor workers' adherence to these precautions (*5,24*).

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TABLE 3. HIV-infected health-care workers with no reported nonoccupational risk factors and for whom case histories have been published in the scientific literature

Cases with Documented Seroconversion					
Case	**Occupation**	**Country**	**Type of Exposure**	**Source**	**Reference**
1*	NS†	United States	Needlestick	AIDS patient	This report
2	NS	United States	Needlestick	AIDS patient	*(4,6)*
3	NS	United States	Needlestick	AIDS patient	*(5)*
4	NS	United States	2 Needlesticks	AIDS patient, HIV-infected patient	*(5)*
5	NS	United States	Needlestick	AIDS patient	*(9)*
6	Nurse	England	Needlestick	AIDS patient	*(12)*
7	Nurse	France	Needlestick	HIV-infected patient	*(13)*
8	Nurse	Martinique	Needlestick	AIDS patient	*(14)*
9	Research lab worker	United States	Cut with sharp object	Concentrated virus	*(15,16)*
10	Home health-care provider	United States	Cutaneous§	AIDS patient	*(17)*
11	NS	United States	Nonintact skin	AIDS patient	*(18)*
12	Phlebotomist	United States	Mucous-membrane	HIV-infected patient	*(18)*
13	Technologist	United States	Nonintact skin	HIV-infected patient	*(18)*
14	NS	United States	Needlestick	AIDS patient	*(19)*
15	Nurse	Italy	Mucous-membrane	HIV-infected patient	*(20)*

Cases without Documented Seroconversion					
Case	**Occupation**	**Country**	**Type of Exposure**	**Source**	**Reference**
1	NS	United States	Puncture wound	AIDS patient	*(3,4)*
2	NS	United States	2 Needlesticks	2 AIDS patients	*(3)*
3	Research lab worker	United States	Nonintact skin	Concentrated virus	*(15,16)*
4	Home health-care provider	England	Nonintact skin	AIDS patient	*(21)*
5	Dentist	United States	Multiple needlesticks	Unknown	*(22)*
6*	Technician	Mexico	Multiple needle-sticks and mucous-membrane	Unknown	*(23)*
7	Lab worker	United States	Needlestick, puncture wound	Unknown	*(3)*

*Health-care worker diagnosed with AIDS.
†NS = not specified.
§Mother who provided nursing care for her child with HIV infection; extensive contact with the child's blood and body secretions and excretions occurred; the mother did not wear gloves and often did not wash her hands immediately after exposure.

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TABLE I. Summary – cases of specified notifiable diseases, United States

Disease	15th Week Ending			Cumulative, 15th Week Ending		
	April 16, 1988	April 18, 1987	Median 1983-1987	April 16, 1988	April 18, 1987	Median 1983-1987
Acquired Immunodeficiency Syndrome (AIDS)	206	U *	198	8,643	5,528	1,874
Aseptic meningitis	63	96	87	1,073	1,334	1,230
Encephalitis: Primary (arthropod-borne & unspec)	11	17	18	174	238	249
Post-infectious	4	3	3	22	19	27
Gonorrhea: Civilian	9,428	13,471	15,128	191,872	232,232	236,195
Military	202	478	341	3,513	5,002	5,866
Hepatitis: Type A	518	453	410	6,985	7,223	6,526
Type B	421	499	499	5,703	7,219	7,034
Non A, Non B	50	68	68	696	906	962
Unspecified	33	67	110	606	965	1,433
Legionellosis	10	26	9	191	222	173
Leprosy	-	3	6	49	63	77
Malaria	19	7	13	188	195	195
Measles: Total†	113	111	104	646	1,064	754
Indigenous	68	110	96	559	950	660
Imported	45	1	4	87	114	94
Meningococcal infections	76	44	48	1,040	1,164	991
Mumps	130	447	101	1,494	5,591	1,206
Pertussis	57	29	43	674	524	525
Rubella (German measles)	3	12	11	62	95	144
Syphilis (Primary & Secondary): Civilian	613	526	485	10,573	9,636	8,152
Military	1	5	7	59	62	72
Toxic Shock syndrome	6	12	8	80	96	110
Tuberculosis	442	332	418	5,116	5,547	5,547
Tularemia	1	2	2	28	25	25
Typhoid Fever	9	12	7	97	78	78
Typhus fever, tick-borne (RMSF)	-	2	3	19	13	21
Rabies, animal	80	130	139	1,067	1,369	1,369

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1988		Cum. 1988
Anthrax	-	Leptospirosis	8
Botulism: Foodborne	4	Plague	1
Infant (Kans. 1)	11	Poliomyelitis, Paralytic	-
Other	2	Psittacosis (Upstate N.Y. 1)	22
Brucellosis (Miss. 1)	15	Rabies, human	-
Cholera	-	Tetanus	9
Congenital rubella syndrome	-	Trichinosis (Mich. 1)	5
Congenital syphilis, ages < 1 year	-		
Diphtheria	-		

*Because AIDS cases are not received weekly from all reporting areas, comparison of weekly figures may be misleading.
†Forty-five of the 113 reported cases for this week were imported from a foreign country or can be directly traceable to a known internationally imported case within two generations.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending April 16, 1988 and April 18, 1987 (15th Week)

Reporting Area	AIDS	Aseptic Menin-gitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionel-losis	Leprosy
			Primary	Post-in-fectious			A	B	NA,NB	Unspeci-fied		
	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988
UNITED STATES	8,643	1,073	174	22	191,872	232,232	6,985	5,703	696	606	191	49
NEW ENGLAND	336	54	7	-	5,846	7,988	254	392	71	35	8	9
Maine	14	5	1	-	137	249	11	17	3	1	1	-
N.H.	8	10	-	-	93	131	16	13	4	2	-	-
Vt.	3	3	2	-	46	60	3	13	4	-	-	-
Mass.	202	21	3	-	2,097	2,985	144	239	48	27	5	8
R.I.	13	12	-	-	505	635	38	46	8	-	2	1
Conn.	96	3	1	-	2,968	3,928	42	64	4	5	-	-
MID. ATLANTIC	2,976	132	19	-	29,174	37,470	388	678	43	49	38	4
Upstate N.Y.	451	74	14	-	3,800	4,791	247	189	22	4	23	-
N.Y. City	1,671	21	4	-	12,650	20,300	61	288	4	33	2	4
N.J.	661	37	1	-	4,319	4,660	80	201	17	12	-	-
Pa.	193	-	-	-	8,405	7,719	-	-	-	-	13	-
E.N. CENTRAL	629	136	30	1	30,132	32,874	344	574	39	38	58	-
Ohio	140	55	13	1	7,144	6,898	106	168	12	5	20	-
Ind.	51	23	5	-	2,418	2,734	41	83	3	14	5	-
Ill.	293	2	-	-	8,601	9,923	29	32	-	2	-	-
Mich.	113	51	9	-	9,874	10,380	134	250	17	17	24	-
Wis.	32	5	3	-	2,095	2,939	34	41	7	-	9	-
W.N. CENTRAL	191	55	13	2	7,632	9,364	437	289	26	10	14	-
Minn.	42	13	2	-	1,054	1,555	15	40	5	3	-	-
Iowa	10	11	7	-	516	921	24	28	4	-	4	-
Mo.	83	12	-	-	4,360	4,740	243	171	11	5	1	-
N. Dak.	-	-	-	-	45	110	2	2	1	-	1	-
S. Dak.	3	5	-	1	162	182	-	1	1	-	5	-
Nebr.	16	3	1	1	471	542	15	16	-	-	2	-
Kans.	37	11	3	-	1,024	1,314	138	31	4	2	1	-
S. ATLANTIC	1,279	241	23	8	54,292	61,334	542	1,167	90	85	33	1
Del.	14	5	1	-	768	884	10	33	4	2	4	-
Md.	114	29	2	2	5,334	6,631	57	195	6	2	5	1
D.C.	137	5	-	-	3,474	4,074	5	11	2	1	-	-
Va.	126	27	12	1	3,853	4,871	110	74	23	56	4	-
W. Va.	5	5	1	-	480	492	3	21	2	3	-	-
N.C.	87	42	6	-	8,799	9,131	116	199	21	-	12	-
S.C.	42	4	-	-	4,064	5,292	15	181	4	3	4	-
Ga.	185	31	1	-	10,654	10,435	91	192	4	1	2	-
Fla.	569	93	-	5	16,866	19,524	135	261	24	17	2	-
E.S. CENTRAL	247	80	16	5	14,681	16,963	313	359	55	6	8	1
Ky.	34	29	4	1	1,224	1,732	281	72	23	2	4	-
Tenn.	120	8	5	-	4,845	5,783	23	173	14	-	2	-
Ala.	60	33	7	2	5,088	5,518	3	97	16	4	2	1
Miss.	33	10	-	2	3,524	3,930	6	17	2	-	-	-
W.S. CENTRAL	739	94	12	-	21,955	24,886	689	388	54	148	6	6
Ark.	30	3	2	-	1,973	2,470	85	19	1	3	-	-
La.	116	16	1	-	4,687	5,042	34	82	8	3	3	-
Okla.	35	7	3	-	1,978	2,848	182	59	15	10	3	-
Tex.	558	68	6	-	13,317	14,526	388	228	30	132	-	6
MOUNTAIN	311	42	15	1	4,101	6,288	993	469	69	65	9	-
Mont.	5	1	-	-	119	153	17	16	4	2	-	-
Idaho	3	-	-	-	113	214	49	28	2	1	-	-
Wyo.	1	1	-	-	68	124	1	1	3	-	1	-
Colo.	109	13	2	-	994	1,267	59	57	9	29	4	-
N. Mex.	14	1	1	-	396	663	181	60	3	1	-	-
Ariz.	117	14	5	-	1,385	2,305	519	206	28	19	1	-
Utah	19	6	3	1	195	218	109	34	16	11	2	-
Nev.	43	6	4	-	831	1,344	58	67	4	2	1	-
PACIFIC	1,935	239	39	5	24,059	35,065	3,025	1,387	249	170	17	28
Wash.	108	-	1	3	1,929	2,542	616	158	37	18	6	-
Oreg.	63	-	-	-	872	1,271	568	209	29	7	-	-
Calif.	1,728	212	37	2	20,700	30,363	1,741	983	180	141	9	28
Alaska	7	6	-	-	321	573	97	27	2	3	-	-
Hawaii	29	21	1	-	237	316	3	10	1	1	2	-
Guam	-	-	-	-	35	60	2	3	-	2	-	3
P.R.	287	9	1	-	442	651	7	76	16	12	-	-
V.I.	9	-	-	-	118	70	-	3	-	-	-	-
Amer. Samoa	-	-	-	-	-	159	-	-	-	-	-	-
C.N.M.I.	-	-	-	-	13	30	-	1	-	-	-	-

N: Not notifiable U: Unavailable C.N.M.I.: Commonwealth of the Northern Mariana Islands

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending April 16, 1988 and April 18, 1987 (15th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1988	1988	Cum. 1988	1988	Cum. 1988	Cum. 1987	Cum. 1988	1988	Cum. 1988	1988	Cum. 1988	Cum. 1987	1988	Cum. 1988	Cum. 1987
UNITED STATES	188	68	559	45	87	1,064	1,040	130	1,494	57	674	524	3	62	95
NEW ENGLAND	19	1	2	43	44	58	81	-	5	2	75	14	-	-	-
Maine	2	-	-	-	-	3	3	-	-	-	11	-	-	-	-
N.H.	-	1	1	43†	43	43	8	-	3	-	21	1	-	-	-
Vt.	-	-	-	-	-	6	2	-	-	-	1	3	-	-	-
Mass.	12	-	1	-	-	2	35	-	2	2	34	3	-	-	-
R.I.	3	-	-	-	-	-	13	-	-	-	1	-	-	-	-
Conn.	2	-	-	-	1	4	20	-	-	-	7	7	-	-	-
MID. ATLANTIC	25	19	151	-	2	155	85	22	143	3	19	74	-	4	3
Upstate N.Y.	12	-	-	-	2	16	44	-	28	1	7	57	-	1	1
N.Y. City	7	1	15	-	-	111	15	1	45	-	1	-	-	1	1
N.J.	4	-	-	-	-	8	26	2	20	-	1	4	-	1	1
Pa.	2	18	136	-	-	20	-	19	50	2	10	13	-	1	-
E.N. CENTRAL	9	3	42	-	3	127	101	8	385	14	74	71	-	20	17
Ohio	1	-	-	-	3	4	40	-	49	-	16	23	-	-	-
Ind.	-	-	-	-	-	-	8	1	22	14	38	-	-	-	-
Ill.	-	2	30	-	-	64	2	4	139	-	2	4	-	16	16
Mich.	7	1	12	-	-	23	38	3	122	-	13	20	-	4	1
Wis.	1	-	-	-	-	36	13	-	53	-	5	24	-	-	-
W.N. CENTRAL	5	-	-	-	-	18	42	9	76	-	33	34	-	-	1
Minn.	2	-	-	-	-	-	13	-	-	-	4	7	-	-	-
Iowa	-	-	-	-	-	-	-	2	24	-	14	3	-	-	1
Mo.	2	-	-	-	-	18	15	1	19	-	5	13	-	-	-
N. Dak.	-	-	-	-	-	-	-	-	-	-	6	2	-	-	-
S. Dak.	-	-	-	-	-	-	1	-	-	-	2	2	-	-	-
Nebr.	-	-	-	-	-	-	5	-	5	-	-	-	-	-	-
Kans.	1	-	-	-	-	-	8	6	28	-	2	7	-	-	-
S. ATLANTIC	21	4	115	-	9	26	185	9	128	3	55	115	-	1	8
Del.	-	-	-	-	-	-	1	-	-	-	3	-	-	-	-
Md.	2	-	-	-	2	-	21	1	7	-	10	1	-	-	1
D.C.	4	-	-	-	-	-	5	5	50	-	-	-	-	-	-
Va.	5	4	46	-	2	-	22	-	29	-	7	32	-	-	1
W. Va.	-	-	6	-	-	-	-	1	4	-	-	16	-	-	-
N.C.	2	-	-	-	1	-	31	1	18	-	21	51	-	-	-
S.C.	3	-	-	-	-	-	20	-	3	-	-	-	-	-	-
Ga.	1	-	-	-	-	-	27	1	8	3	13	12	-	-	1
Fla.	4	-	63	-	4	26	58	-	9	-	1	3	-	1	5
E.S. CENTRAL	3	-	5	-	-	-	101	32	218	-	7	7	-	-	2
Ky.	-	-	-	-	-	-	19	21	58	-	-	1	-	-	2
Tenn.	-	-	-	-	-	-	59	11	152	-	6	1	-	-	-
Ala.	3	-	-	-	-	-	17	-	6	-	-	3	-	-	-
Miss.	-	-	5	-	-	-	6	N	N	-	1	2	-	-	-
W.S. CENTRAL	18	-	9	-	-	68	66	38	243	-	29	36	-	4	1
Ark.	-	-	-	-	-	-	9	-	3	-	5	2	-	3	1
La.	2	-	-	-	-	-	18	23	104	-	2	6	-	-	-
Okla.	5	-	8	-	-	1	7	15	66	-	22	28	-	1	-
Tex.	11	-	1	-	-	67	32	-	70	-	-	-	-	-	-
MOUNTAIN	10	-	113	-	-	221	36	6	87	24	262	49	-	2	6
Mont.	1	-	-	-	-	1	-	-	-	-	1	2	-	-	-
Idaho	-	-	-	-	-	-	2	-	1	7	215	18	-	-	1
Wyo.	-	-	-	-	-	-	-	-	2	-	1	2	-	-	1
Colo.	4	-	113	-	-	-	9	3	20	2	6	17	-	1	-
N. Mex.	1	-	-	-	-	218	8	N	N	-	1	1	-	-	-
Ariz.	2	-	-	-	-	2	10	3	54	5	18	8	-	-	-
Utah	1	-	-	-	-	-	6	-	2	10	19	1	-	-	4
Nev.	1	-	-	-	-	-	1	-	8	-	1	-	-	1	-
PACIFIC	78	41	122	2	29	391	343	6	209	11	120	124	3	31	57
Wash.	6	-	-	-	-	-	27	-	9	4	25	21	-	-	-
Oreg.	4	-	-	-	-	28	16	N	N	-	3	13	-	-	1
Calif.	67	41	122	2†	28	361	285	6	195	7	70	56	3	29	53
Alaska	1	-	-	-	-	-	4	-	5	-	3	3	-	-	-
Hawaii	-	-	-	-	1	2	11	-	-	-	19	31	-	2	3
Guam	-	-	-	-	1	2	-	-	2	-	-	-	-	1	-
P.R.	1	5	109	-	-	301	4	1	4	-	3	11	-	-	1
V.I.	-	-	-	-	-	-	-	2	11	-	-	-	-	-	-
Amer. Samoa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
C.N.M.I.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*For measles only, imported cases includes both out-of-state and international importations.

N: Not notifiable U: Unavailable †International §Out-of-state

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending April 16, 1988 and April 18, 1987 (15th Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988
UNITED STATES	10,573	9,636	80	5,116	5,547	28	97	19	1,067
NEW ENGLAND	305	135	7	97	144	1	7	-	3
Maine	5	1	1	3	10	-	-	-	1
N.H.	2	2	2	-	5	-	-	-	2
Vt.	-	1	2	-	4	-	-	-	-
Mass.	125	72	2	61	58	1	5	-	-
R.I.	11	2	-	8	16	-	-	-	-
Conn.	162	57	-	25	51	-	2	-	-
MID. ATLANTIC	2,132	1,620	13	902	1,016	-	15	1	106
Upstate N.Y.	138	64	7	167	171	-	2	-	1
N.Y. City	1,398	1,127	2	366	501	-	6	1	-
N.J.	238	187	2	176	156	-	7	-	-
Pa.	358	242	2	193	188	-	-	-	105
E.N. CENTRAL	322	283	11	638	666	1	9	-	19
Ohio	29	29	8	114	137	-	2	-	-
Ind.	18	15	-	71	58	-	2	-	3
Ill.	170	174	-	248	279	-	4	-	5
Mich.	98	43	3	167	170	1	1	-	3
Wis.	7	22	-	38	22	-	-	-	8
W.N. CENTRAL	68	39	11	148	154	11	2	1	138
Minn.	6	5	-	25	44	-	1	-	58
Iowa	8	7	2	10	8	-	-	-	13
Mo.	35	20	5	73	74	9	1	1	5
N. Dak.	1	-	-	2	1	-	-	-	21
S. Dak.	5	3	-	16	6	-	-	-	32
Nebr.	7	3	2	4	11	1	-	-	1
Kans.	6	1	2	18	10	1	-	-	8
S. ATLANTIC	3,740	3,299	8	1,140	1,109	5	14	11	367
Del.	47	27	-	13	11	1	-	-	13
Md.	204	179	1	96	94	-	-	-	85
D.C.	175	98	-	49	34	-	-	-	1
Va.	128	77	-	127	101	3	6	-	130
W. Va.	1	4	-	30	35	-	-	-	26
N.C.	236	180	5	71	112	-	1	10	-
S.C.	159	226	-	118	105	-	-	1	19
Ga.	605	477	-	186	157	1	2	-	65
Fla.	2,185	2,031	2	450	460	-	5	-	28
E.S. CENTRAL	541	605	10	417	449	4	1	3	104
Ky.	18	4	3	120	116	3	1	-	45
Tenn.	198	280	4	100	123	-	-	1	32
Ala.	165	160	3	128	157	-	-	2	27
Miss.	160	161	-	69	53	1	-	-	-
W.S. CENTRAL	1,131	1,295	7	612	600	3	2	1	137
Ark.	55	63	-	59	57	1	-	-	31
La.	209	222	-	92	80	-	2	-	-
Okla.	48	43	2	58	69	2	-	1	5
Tex.	819	967	5	403	394	-	-	-	101
MOUNTAIN	194	199	7	114	162	3	4	1	88
Mont.	2	7	-	-	8	-	1	-	71
Idaho	-	1	2	2	16	-	-	1	-
Wyo.	-	-	-	-	-	-	-	-	6
Colo.	28	29	1	8	26	3	3	-	-
N. Mex.	17	15	-	31	27	-	-	-	3
Ariz.	53	102	1	58	76	-	-	-	7
Utah	7	7	3	-	1	-	-	-	1
Nev.	87	38	-	15	8	-	-	-	-
PACIFIC	2,140	2,161	6	1,048	1,247	-	43	1	105
Wash.	61	43	-	61	53	-	3	-	-
Oreg.	81	65	-	35	38	-	4	-	-
Calif.	1,984	2,047	6	892	1,076	-	34	1	103
Alaska	3	2	-	11	21	-	-	-	2
Hawaii	11	4	-	49	59	-	2	-	-
Guam	-	1	-	7	4	-	-	-	-
P.R.	180	292	-	54	76	-	2	-	22
V.I.	1	3	-	3	2	-	-	-	-
Amer. Samoa	-	83	-	-	51	-	-	-	-
C.N.M.I.	-	2	-	-	-	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending April 16, 1988 (15th Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	728	534	119	46	11	18	66
Boston, Mass.	181	113	42	12	5	9	23
Bridgeport, Conn.	72	63	5	3	1	-	10
Cambridge, Mass.	29	22	4	3	-	-	2
Fall River, Mass.	16	15	1	-	-	-	1
Hartford, Conn.	69	53	7	5	1	3	5
Lowell, Mass.	25	20	3	1	-	1	2
Lynn, Mass.	21	19	1	1	-	-	-
New Bedford, Mass.	24	18	3	1	1	1	1
New Haven, Conn.	70	45	14	9	-	2	7
Providence, R.I.	52	38	11	3	-	-	3
Somerville, Mass.	8	6	2	-	-	-	-
Springfield, Mass.	46	32	9	3	1	1	4
Waterbury, Conn.	32	26	5	1	-	-	4
Worcester, Mass.	83	64	12	4	2	1	4
MID. ATLANTIC	3,037	1,956	630	334	57	58	200
Albany, N.Y.	40	26	9	2	3	-	1
Allentown, Pa.	22	18	2	2	-	-	-
Buffalo, N.Y.	124	95	19	5	2	3	5
Camden, N.J.	37	24	9	4	-	-	2
Elizabeth, N.J.	25	21	4	-	-	-	4
Erie, Pa.†	41	31	5	5	-	-	4
Jersey City, N.J.	44	20	10	6	2	6	2
N.Y. City, N.Y.	1,545	951	327	209	28	30	79
Newark, N.J.	148	61	34	36	8	7	16
Paterson, N.J.	33	15	10	6	-	2	1
Philadelphia, Pa.	480	332	108	29	7	4	44
Pittsburgh, Pa.†	75	48	18	5	1	3	-
Reading, Pa.	41	34	6	1	-	-	8
Rochester, N.Y.	132	99	20	10	2	1	18
Schenectady, N.Y.	23	18	4	1	-	-	-
Scranton, Pa.†	31	24	6	1	-	-	-
Syracuse, N.Y.	104	78	19	4	3	-	10
Trenton, N.J.	40	22	10	6	1	1	1
Utica, N.Y.	23	19	2	1	-	1	4
Yonkers, N.Y.	29	20	8	1	-	-	1
E.N. CENTRAL	2,578	1,715	560	165	52	86	130
Akron, Ohio	75	54	15	2	1	3	3
Canton, Ohio	35	27	4	2	2	-	2
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	173	120	31	9	6	7	29
Cleveland, Ohio	170	108	41	11	2	8	5
Columbus, Ohio	129	78	40	5	1	5	1
Dayton, Ohio	131	89	32	7	2	1	13
Detroit, Mich.	293	175	68	28	8	14	4
Evansville, Ind.	50	41	6	2	-	1	2
Fort Wayne, Ind.	71	54	9	5	1	2	5
Gary, Ind.	9	3	5	1	-	-	-
Grand Rapids, Mich.	114	86	14	7	3	4	6
Indianapolis, Ind.	196	118	54	17	4	3	4
Madison, Wis.	36	25	8	2	-	1	4
Milwaukee, Wis.	136	100	22	5	3	6	9
Peoria, Ill.	57	38	14	3	-	2	4
Rockford, Ill.	45	30	9	4	2	-	5
South Bend, Ind.	79	59	14	3	1	2	7
Toledo, Ohio	101	69	20	5	4	3	8
Youngstown, Ohio	114	79	29	2	2	2	3
W.N. CENTRAL	856	597	144	51	25	39	48
Des Moines, Iowa	78	56	13	5	1	3	3
Duluth, Minn.	41	38	2	-	-	1	3
Kansas City, Kans.	40	26	8	1	2	3	3
Kansas City, Mo.	128	75	33	10	5	5	2
Lincoln, Nebr.	46	38	5	2	1	-	4
Minneapolis, Minn.	172	117	32	11	2	10	15
Omaha, Nebr.	68	48	8	4	3	5	5
St. Louis, Mo.	153	108	22	8	6	9	7
St. Paul, Minn.	57	39	8	2	5	3	3
Wichita, Kans.	73	52	13	8	-	-	3
S. ATLANTIC	1,328	836	294	105	39	52	72
Atlanta, Ga.	171	110	36	19	4	2	1
Baltimore, Md.	245	152	54	13	6	20	12
Charlotte, N.C.	71	46	19	3	-	3	3
Jacksonville, Fla.	124	74	29	9	10	2	6
Miami, Fla.	156	93	39	11	6	7	2
Norfolk, Va.	52	33	12	4	1	2	8
Richmond, Va.	81	57	18	3	2	1	12
Savannah, Ga.	54	40	10	2	1	1	3
St. Petersburg, Fla.	99	78	11	7	2	1	6
Tampa, Fla.	53	29	17	4	-	2	3
Washington, D.C.	206	115	42	30	7	11	16
Wilmington, Del.	16	9	7	-	-	-	-
E.S. CENTRAL	909	603	177	60	32	37	66
Birmingham, Ala.	146	92	31	11	6	6	5
Chattanooga, Tenn.	72	52	17	2	1	-	11
Knoxville, Tenn.	104	72	22	6	4	-	11
Louisville, Ky.	112	68	26	2	5	11	7
Memphis, Tenn.	210	145	29	19	8	9	14
Mobile, Ala.	75	47	19	6	2	1	7
Montgomery, Ala.	62	48	9	2	-	3	4
Nashville, Tenn.	128	79	24	12	6	7	7
W.S. CENTRAL	1,394	849	293	126	55	71	68
Austin, Tex.	55	40	9	3	1	2	8
Baton Rouge, La.	68	38	12	5	4	9	1
Corpus Christi, Tex.	32	21	5	5	-	1	-
Dallas, Tex.	207	112	44	26	9	16	8
El Paso, Tex.	70	39	14	10	4	3	8
Fort Worth, Tex	128	74	24	14	3	13	6
Houston, Tex.§	308	176	74	34	13	11	7
Little Rock, Ark.	77	55	18	-	2	2	5
New Orleans, La.	117	76	24	8	7	2	-
San Antonio, Tex.	161	99	37	13	7	5	13
Shreveport, La.	56	43	9	1	1	2	5
Tulsa, Okla.	115	76	23	7	4	5	7
MOUNTAIN	773	490	161	73	30	19	33
Albuquerque, N. Mex.	89	55	15	11	8	-	2
Colo. Springs, Colo.	39	22	11	2	2	2	3
Denver, Colo.	129	85	24	15	2	3	5
Las Vegas, Nev.	121	77	27	12	3	2	5
Ogden, Utah	26	16	7	2	-	1	4
Phoenix, Ariz.	158	95	38	13	7	5	5
Pueblo, Colo.	28	14	9	5	-	-	1
Salt Lake City, Utah	49	23	12	7	3	4	-
Tucson, Ariz.	134	103	18	6	5	2	8
PACIFIC	1,927	1,248	383	171	72	48	135
Berkeley, Calif.	16	9	5	-	-	2	3
Fresno, Calif.	91	58	21	6	2	4	8
Glendale, Calif.	21	15	5	1	-	-	-
Honolulu, Hawaii	60	38	14	2	4	2	7
Long Beach, Calif.	81	59	16	3	2	1	17
Los Angeles Calif.	459	294	88	52	19	2	23
Oakland, Calif.	87	53	20	8	4	2	4
Pasadena, Calif.	31	23	4	2	1	1	2
Portland, Oreg.	129	85	34	6	2	2	6
Sacramento, Calif.	141	87	25	17	8	4	11
San Diego, Calif.	175	110	32	17	8	8	15
San Francisco, Calif.	174	108	35	23	2	6	6
San Jose, Calif.	206	136	44	13	4	8	19
Seattle, Wash.	169	109	26	17	13	4	4
Spokane, Wash.	51	39	7	4	1	-	4
Tacoma, Wash.	36	25	7	-	2	2	6
TOTAL	13,530††	8,828	2,761	1,131	373	428	818

*Mortality data in this table are voluntarily reported from 121 cities in the United states, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

**Pneumonia and influenza.

†Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

††Total includes unknown ages.

§Data not available. Figures are estimates based on average of past available 4 weeks.

AIDS and HIV — Continued

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Passive Smoking: Beliefs, Attitudes, and Exposures — United States, 1986

In December 1986, the 18th Surgeon General's report on smoking and health was released (*1*). This report, "The Health Consequences of Involuntary Smoking," described the health effects of exposure to environmental tobacco smoke (ETS). Its major conclusions were 1) that involuntary (or passive) smoking is a cause of disease, including lung cancer, in healthy nonsmokers, and 2) that children of parents who smoke have a higher frequency of respiratory infections, such as pneumonia and bronchitis, than do children of nonsmoking parents.

To evaluate beliefs, attitudes, and exposure related to involuntary smoking among U.S. residents, questions about ETS were included in the 1986 Adult Use of Tobacco Survey, which was conducted by the Office on Smoking and Health, Center for Health Promotion and Education, CDC. Data for this telephone survey were collected from a national probability sample of 13,031 adults (≥17 years of age) representing the noninstitutionalized, civilian U.S. population (*2*). Respondents were asked if they thought ETS was harmful to health in general and to their own health specifically and

Passive Smoking — Continued

if they were annoyed by exposure to ETS. In addition, working respondents (n = 8,600) were asked about the extent of their exposure to ETS at work and about policies that restrict smoking at their worksites. Finally, respondents were asked whether they would choose smoking or nonsmoking sections in planes, restaurants, and other public places when a choice was available.

Eighty-eight percent of all respondents (93% of never smokers, 89% of former smokers) considered ETS to be generally harmful to health. In addition, 79% of current smokers felt that ETS was generally harmful; of these, 75% reported that ETS was "very harmful" or "somewhat harmful," as opposed to "slightly harmful" or "not harmful." Sixty-nine percent of all respondents (62% of former smokers, 74% of never smokers) considered ETS to be harmful to their own health.* Seventy-one percent of all respondents (43% of current smokers, 74% of former smokers, and 85% of never smokers) were annoyed by the cigarette smoke of others.

Among working respondents, 42% reported restrictions on smoking in their workplaces; 3% reported a total ban on smoking; and 55% reported no restrictions. Sixty-five percent of respondents who reported no restrictions against smoking in their worksites are at least somewhat exposed to ETS. Of these, 14% reported a "very smoky" worksite. Fifty-three percent of respondents who worked in environments with restrictive smoking policies reported exposure to ETS. Of these, 11% reported that their worksite is "very smoky." Even among the 2.5% of respondents reporting a total ban on smoking in the workplace, 21% still reported being at least somewhat exposed to ETS at work.

If given a choice, 61% of all respondents choose nonsmoking seating in airplanes, restaurants, and other public places. Most former smokers (69%) and never smokers (82%) choose nonsmoking sections, as do 14% of current smokers.

Reported by: Office on Smoking and Health, Center for Health Promotion and Education, CDC.

Editorial Note: These data indicate that a large percentage of smokers and nonsmokers regard ETS as a health hazard. In addition, a majority of nonsmokers and almost half of current smokers are annoyed by ETS. These results represent substantial changes in beliefs and attitudes since the 1970s. For example, a national opinion survey conducted by the Roper Organization in 1978 for the Tobacco Institute (*3*) showed that 58% of respondents (40% of smokers, 69% of nonsmokers) considered passive smoking hazardous. The Roper survey also found that 60% of nonsmokers and 5% of smokers were annoyed by being near a person who was smoking.

In 1986, 36% of a random sample of the members of the American Society for Personnel Administration (ASPA)[†] reported that their worksites had restrictive smoking policies (*4*). A similar percentage of respondents to the Adult Use of Tobacco Survey reported such policies. In a second survey of ASPA members in 1987, the percentage of members reporting a restrictive smoking policy had increased to 54% (*4*). Data from the Adult Use of Tobacco Survey suggest that these policies reduce, but do not eliminate, ETS exposure in the workplace. In fact, the 1986 Surgeon General's report concluded that simply separating smokers and nonsmokers within the same airspace is not sufficient to prevent exposure of nonsmokers to ETS (*1*).

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*Current smokers were not asked this question.

[†]ASPA is a society of personnel executives representing manufacturing and nonmanufacturing firms and nonbusiness organizations such as hospitals, educational institutions, and government agencies.

Passive Smoking — Continued

These data also show that the majority of Americans would choose nonsmoking sections in airplanes, restaurants, and other public places, if given a choice. In 1986, the Committee on Airliner Cabin Air Quality, which was appointed by the National Academy of Sciences, recommended a ban on smoking on all commercial domestic flights for the following reasons: 1) to lessen irritation and discomfort among passengers and crew, 2) to reduce potential health hazards for the cabin crew, 3) to eliminate the possibility of fires caused by cigarettes, and 4) to bring the cabin air quality into line with established standards for other closed environments (*5*). On April 23, 1988, a new federal law that prohibits smoking on domestic flights of 2 hours or less takes effect. This legislation is part of an ongoing national effort to protect nonsmokers from exposure to ETS. Regulations issued by the General Services Administration (GSA) in December 1986 now prohibit smoking in GSA-controlled facilities except in designated smoking areas (*6*). The 1990 Health Objectives for the Nation, which were adopted by the Public Health Service, recommend that all 50 states have laws by 1990 that both prohibit smoking in enclosed public places and require separate smoking areas in the workplace and in dining establishments (*7*).

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Update on Influenza Activity — United States and Worldwide, with Recommendations for Influenza Vaccine Composition for the 1988–89 Season

Worldwide

Although influenza activity in the United States this season has been primarily associated with type A(H3N2), influenza B has been the predominant virus type reported from other areas of the world.

Between October 1987 and April 1988, localized outbreaks of influenza B occurred in Finland, France, Greece, the United Kingdom, West Germany, and the Union of Soviet Socialist Republics (U.S.S.R.). In Japan, a localized outbreak of influenza B occurred during November of 1987, and sporadically occurring cases were confirmed through February of 1988. Sporadically occurring cases of influenza B were also confirmed from North Korea during March. Influenza B has been the most frequently isolated influenza virus in the western provinces of Canada; during February, it was

Influenza — Continued

associated with an outbreak in Calgary, Alberta. Influenza B has also been the predominant virus type in Ontario since October of 1987. In the United States, influenza B has accounted for 9% of isolates reported nationally by World Health Organization (WHO) Collaborating Laboratories; only Hawaii has reported influenza B as the predominant virus type.

Influenza A(H3N2) caused localized outbreaks in Taiwan from September through November of 1987. Singapore reported isolating influenza A(H3N2) viruses from sporadically occurring cases during September and October 1987, and Japan made similar reports from October 1987 through February 1988. In Europe, influenza A(H3N2) was associated with localized outbreaks in East Germany and Romania during March. Localized outbreaks of influenza A(H3N2) in the U.S.S.R. during January and February escalated to widespread activity during March, as an epidemic of influenza B was waning. Sporadically occurring cases of influenza A(H3N2) were confirmed in several European countries, including Finland, France, Hungary, Norway, and the United Kingdom between January and March 1988 and in Egypt during January and February. Sporadic influenza A(H3N2) activity has also been reported in several Canadian provinces, and a few localized outbreaks have been associated with influenza A, but the subtype of these viruses has not been identified.

Sporadically occurring cases of influenza A(H1N1) have been confirmed in the United States since January of this year and have been confirmed recently in Canada. In Europe, influenza A(H1N1) was isolated from sporadically occurring cases in Switzerland during February and March. A localized outbreak of influenza A(H1N1) was reported in a primary school in Italy during March.

United States

Surveillance indicators in the United States suggest that influenza activity is waning. Reports from state and territorial epidemiologists have shown a progressive decline in outbreak activity since the week ending March 12, when 57% of the states were still reporting regional or widespread outbreaks of influenza-like illness. For the week ending April 16, two states reported widespread activity, and five states reported regional activity. For the same week, the percentage of patients visiting reporting sentinel physicians for influenza-like illnesses dropped to a low of 3.4%, from a peak of 8.1% for the week ending February 20. The number of specimens tested and the number of influenza viruses isolated at WHO Collaborating Laboratories have also declined since the end of February, from a peak of over 1,700 specimens tested with approximately 300 influenza viruses isolated, to 448 specimens tested and 43 viruses isolated for the week ending April 16. However, the ratio of pneumonia and influenza deaths to deaths from all causes, which has declined since reaching a peak on the week ending March 5, remains above the epidemic threshold for the ninth week.

Antigenic Analysis of Recent Influenza Isolates and Recommendations for Influenza Vaccine Composition for the 1988–89 Season

As previously reported (*1*), influenza A(H3N2) viruses isolated in the United States and in other parts of the world during the 1987–88 influenza season were found to be antigenically distinct from viruses that circulated from 1985 through the spring of 1987. Although influenza B viruses have been isolated less frequently, it has become clear, as more isolates become available, that antigenic variation has also occurred among these viruses. Analysis of recent influenza B virus isolates indicates that these antigenic variants are different from the previously prevalent strains B/USSR/100/83

Influenza — Continued

and B/Ann Arbor/1/86 (Table 1). Most recent isolates resemble the reference strain B/Victoria/2/87. The additional antigenic variant B/USSR/2/87, which was isolated in Moscow in December 1987, has been identified less frequently than strains that resemble B/Victoria/2/87.

The antibody response induced by the current type B vaccine strain, B/Ann Arbor/1/86, is greater to the homologous virus than to the reference variant B/Victoria/2/87 (Table 2). Vaccinees in all age groups developed neutralizing antibody titers ≥100 more frequently to B/Ann Arbor/1/86 than to the B/Victoria/2/87 variant (*2*), and the geometric mean titers were higher to the homologous vaccine component than to the B/Victoria/2/87 variant. During the 1987–88 season, influenza A(H1N1) viruses have continued to resemble the A/Taiwan/1/86 and A/Singapore/6/86 viruses, which were first isolated in Asia in 1986.

Based on antigenic analysis of recent influenza viruses, WHO has recommended updated type A(H3N2) and type B antigens for influenza vaccines for use during the 1988–89 influenza season. WHO recommends the same A(H1N1) component that was used in the 1987–88 vaccine (*3*). Consistent with these recommendations, the Public Health Service has recommended the following antigens for the trivalent influenza vaccine to be manufactured in the United States for the 1988–89 influenza season: A/Taiwan/1/86(H1N1), A/Sichuan/2/87(H3N2), and B/Victoria/2/87.

Reported by: F Ruben, MD, Univ of Pittsburgh, Pittsburgh, Pennsylvania. K Edwards, MD, P Palmer, Vanderbilt Univ, Nashville, Tennessee. RB Couch, MD, WA Keitel, MD, Baylor Coll of Medicine, Houston, Texas. National Influenza Centers, Microbiology and Immunology Support Svcs, WHO, Geneva. Div of Virology, Office of Biologics, FDA. Participating State and Territorial Epidemiologists and State Laboratory Directors. WHO Collaborating Center for Influenza, Influenza Br, Div of Viral Diseases, Center for Infectious Diseases, CDC.

TABLE 1. Hemagglutination-inhibition reactions* of influenza type B viruses

	Ferret Antisera				
Reference Antigen	**B/USSR 100/83**	**B/Yamanashi 510/86**	**B/Ann Arbor 1/86**	**B/Victoria 2/87**	**B/USSR 2/87**
B/USSR/100/83	**160**	20	40	40	40
B/Yamanashi/510/86	80	**160**	80	40	40
B/Ann Arbor/1/86	160	20	**160**	80	80
B/Victoria/2/87	80	20	40	**80**	80
B/USSR/2/87	80	20	40	40	**320**

*Titers are the reciprocal of antiserum dilutions; homologous titers appear in bold type. Fourfold or greater differences in reactions of sera with different antigens are considered significant.

TABLE 2. Neutralizing antibody responses to influenza B viruses induced by the 1987–88 trivalent influenza vaccine*

		Pre-Vaccine			Post-Vaccine		
		% with Titer ≥			% with Titer ≥		
Population	**Strain**	**100**	**200**	**(GMT)†**	**100**	**200**	**(GMT)†**
Children/	B/Ann Arbor/1/86	42	23	(68)	87	84	(400)
Young Adult	B/Victoria/2/87	16	6	(32)	42	58	(196)
Elderly	B/Ann Arbor/1/86	33	16	(35)	59	31	(73)
	B/Victoria/2/87	12	6	(22)	31	14	(40)

*Volunteers received trivalent influenza vaccine containing 15μg each of A/Leningrad/360/83 (H3N2), A/Taiwan/1/86(H1N1), and B/Ann Arbor/1/86.
†Geometric mean titer.

Influenza — Continued

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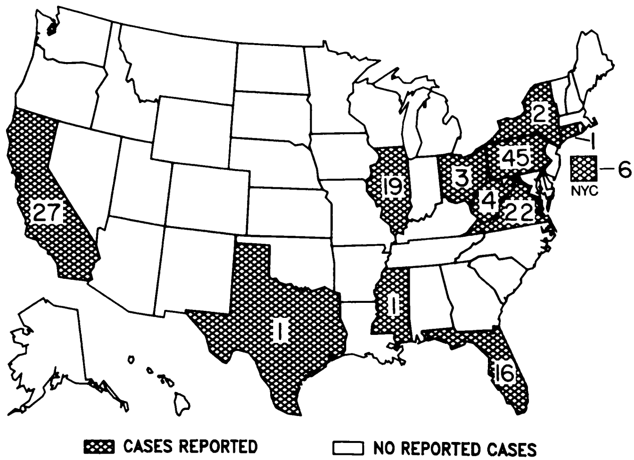
FIGURE I. Reported measles cases — United States, Weeks 11–14, 1988



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